Claims

1. A method for the optimization of multi-objective problems
using evolutionary algorithms, the method comprising the
following steps:
  - setting up an initial population as parents (S1),
  - reproducing the parents to create a plurality of offspring
    individuals (S2, S3),
  - evaluating the quality of the offspring individuals by
    means of a fitness function (S4), wherein the fitness
    function is composed of the sum of weighted sub-functions
    that represent an objective,
  - selecting the offspring(s) having the highest evaluated
    quality value as parents for the next evolution cycle (S5),
c h a r a c t e r i z e d   i n   t h a t
during the optimization the weights for the sub-functions are
changed dynamically respectively within a predefined interval
for every weight.

2. Method according to claim 1,
characterized in that
human preferences represented by linguistic preference
relations are converted into parameterized, real-valued
preferences relations to generate the intervals defining the
allowed range of weight changes.

3. Method according to claim 2,
characterized in that
the parameterized preference relations are converted into
real-valued intervals by letting the parameters take all the
allowed value instead of assigning one specific value to each
parameter.

18

4. Method according to anyone of the preceding claims,
characterized in that
the weights for the different objectives are randomly re-
distributed within the defined intervals among the different
5 offspring individuals in each generation.

5. Method according to anyone of claims 1 to 3,
characterized in that
the weights for the different objectives are changed
10 · gradually within the defined intervals with the proceeding of
optimization.

6. Method according to claim 5,
characterized in that
15 the weights are changed within the intervals according to a
periodic function.

7. Method according to claim 5 or 6,
characterized in that
20 each offspring has the same weight in the same generation.

8. Method according to anyone of claims 5 to 7,
characterized in that
the periodic change has the shape of a sine function applied
25 on the generation number.

9. Computer software program product,
characterized in that
it implements a method according to anyone of the preceding
30 claims when run on a computing device.

10. Use of a method according to anyone of claims 1 to 8 for
the optimization of aerodynamic or hydrodynamic bodies,
wherein different objectives have to be taken into account,

e.g. pressure loss and outlet angle calculated by a Navier-Stokes solver and geometric constraints.